

# Microincisional Diffractive Multifocal Intraocular Lenses

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No financial and proprietary interest in any  
material or method mentioned.

# History

1960

- **Long-incision Cataract Surgery**

- 10 mm (Intra capsular)
- 8 mm (Extra capsular)

1970

- **Small-incision Cataract Surgery**

- Phaco + PMMA IOLs
- 6-7 mm

1990

- **Mini-incision Cataract Surgery**

- Phaco + Foldable IOLs
- 4.0 mm and ↓ ( esp. 2.8-3.2 mm)

2000

- **Micro-incisional Cataract Surgery**

- MICS Phaco + Cartridge systems+ MICS IOLs
- 2.2 mm and ↓ (latest 1.5-1.8 mm)

# Benefits of Smaller Incisions

- **Shortened wound closing time**

- Can İ, Takmaz T, Yıldız Y, Bayhan HA, Soyugelen G, Bostancı B. Coaxial, microcoaxial, and biaxial microincision cataract surgery: prospective comparative study. *J Cataract Refract Surg* 2010 May; 36(5):740-746

- **Decreased incidence of wound closure problems**

- Can İ, Bayhan HA, Çelik H, Bostancı Ceran B. Anterior segment optical coherence tomography evaluation and comparison of main clear corneal incisions in microcoaxial and biaxial cataract surgery *J Cataract Refract Surg* 2011 Mar; 37: 490-500.

- **Less inflammatory reactions**

- Alio J, Rodriguez-Prats JL, Galal A. Advances in microincision cataract surgery intraocular lenses. *Curr Opin Ophthalmol* 2006; 17:80-93.

- **Less endophthalmitis risk**

- Chee S-P, Bacsal K. Endophthalmitis after microincision cataract surgery. *J Cataract Refract Surg* 2005; 31:1834-5.

- **Less peroperatuar complications and risk of expulsive haemorrhage**

- Alio JL. What does MICS require? In: Alio JL, Rodriguez Prats JL, Galal A, eds. *MICS Micro-incision Cataract Surgery. Miami: Highlights of Ophthalmology* 2004: 1- 4.

- **Better preservation of corneal prolate shape and biomechanical properties, Better quality of vision**

- Elkady B, Alio J, Ortiz D, Montalbán R. Corneal aberrations after microincision cataract surgery. *J Cataract Refract Surg* 2008; 34:40-5.

- **Less surgical induced astigmatism allowing use of premium lenses such as presbiopia, and astigmatism correcting IOLs.**

- Can İ, Takmaz T, Bayhan HA, Bostancı Ceran B. Aspheric microincision intraocular lens implantation with biaxial microincision cataract surgery: efficacy and reliability. *J Cataract Refract Surg* 2010 Nov; 36(11):1905-11.
- Can İ, Bostancı Ceran B, Soyugelen G, Takmaz T. Clinical outcomes of two different small incision diffractive multifocal intraocular lenses: Comparative study. *J Cataract Refract Surg* 2012 Jan; 38: 60-7.
- Can İ, Bostancı Ceran B. Micro-incision intraocular lenses (review). *Ophthalmology International*. 2011;6(3):74-79.

- **Less surgical induced higher order aberration allowing use of customized IOLs**

- Can İ, Bayhan HA, Çelik H, Bostancı Ceran B. Comparison of corneal aberrations after biaxial micro-incision and micro-coaxial cataract surgeries: A prospective study. *Curr Eye Res* 2012 Jan; 37 (1): 18-24.

# Microincisional IOLs

## MONOFOCAL

### HYDROPHILIC

- Ultrachoice 1.0 Lenses (Thinoptx, Abingdon, VA, USA)
- AcriFlex MICS IOL 46CSE (Acimed GmbH, Berlin, Ger),
- CareFlex IOL (W20 Medizintechnik AG, Bruchal, Ger),
- SuperFlex and C-Flex (Rayacryl, Rayner IOL Ltd, UK),
- IOLTech MICS lens (LaRoche, Fra and Carl Zeiss Meditec, Stuttgart, Ger),
- Microslim and SlimFlex (PhysIOL, Liege, Belgium)

### HYDROPHOBIC

- Hoya Y-60H (Hoya Corp. Tokyo, Japan)

### HYDROPHILIC BUT HYDROPHOBIC SURFACE

- Aciva UDM 611 (VSY Technologies, İstanbul, Tur)

### FLEKSIACRYL HYBRID

- Miniflex IOL (Mediphacos Ltd, Minas Gerais, Brasil)

### COLLAMER

- NanoFlex (CC4204A) (Staar Surgical Co., Monrovia, Ca, USA)

## TORIC

- AT Lisa Toric 909M / MV (=Acri Comfort 646TLC) ) (Carl Zeiss Meditec, Berlin, Ger) :
- Aciva UD Toric T UDM611 (VSY Technologies, İstanbul, Tur)

## PRESBIOPIA CORRECTING

### ACOMMODATIVE

- TetraFlex KH-3500 micro-incision lens (Lenstec Inc, St. Petersburg, FL, USA)
- 1-CU: (Human Optics, Erlangen, Ger.)

### MULTIFOCAL AND MULTIFOCAL TORIC

- AT LISA (809 M / 809 MV) (Acri.Lisa 366 D)
- AT LISA Toric (AcriLisa Toric 466 D) (Carl Zeiss Meditec, Berlin, Ger)
- Aciva Reviol 611 MFM
- Aciva UD Toric T UDM611 (VSY Biotechnologies, İstanbul, Tur)

### TRIFOCAL

- FineVision Micro F (PhysIOL, Bel)

### DUET

- Sulcoflex (Rayner, UK)

## Comparison of clinical outcomes with 2 small-incision diffractive multifocal intraocular lenses

İzzet Can, MD, Başak Bostancı Ceran, MD, Gülizar Soyugelen, MD, Tamer Takmaz, MD

**PURPOSE:** To evaluate and compare the clinical results of 2 diffractive multifocal small-incision intraocular lenses (IOLs) implanted after biaxial microincision cataract surgery (MICS).

**SETTING:** Atatürk Training and Research Hospital, 2nd Ophthalmology Department, Ankara, Turkey.

**DESIGN:** Comparative case series.

**METHODS:** Eyes that had biaxial MICS with implantation of an Acri.Lisa 366D IOL (Group 1) or Acrya Reviol MFM 611 IOL (Group 2) were followed for at least 6 months postoperatively. Uncorrected distance (UDVA), intermediate (UIVA), and near (UNVA) visual acuities; corrected distance visual acuity; distance-corrected intermediate and near visual acuities; and contrast sensitivity measurements with and without glare were determined. Early and late complications and subjective complaints were recorded and evaluated.

**RESULTS:** The study enrolled 60 eyes of 32 patients. The preoperative and intraoperative data were comparable in the 2 IOL groups. There were no statistically significant postoperative differences in the mean spherical equivalent (Group 1,  $-0.30$  diopter (D)  $\pm 0.30$  (SD); Group 2,  $-0.26 \pm 0.28$  D;  $P = .584$ ), mean UDVA ( $0.80 \pm 0.14$  and  $0.86 \pm 0.17$ , respectively;  $P = .158$ ), and mean Jaeger UNVA ( $1.46 \pm 0.73$  and  $1.23 \pm 0.50$ , respectively;  $P = .155$ ). However, there was a significant difference in mean Jaeger UIVA ( $3.06 \pm 0.90$  and  $2.23 \pm 0.72$ , respectively;  $P = .000$ ). Mesopic contrast sensitivity and the incidence of complications and dysphotopsia symptoms were not significantly different between the 2 IOL groups.

**CONCLUSIONS:** Both IOLs provided excellent distance and near visual acuity and contrast sensitivity. The Group 2 IOL gave better intermediate distance results.

**Financial Disclosure:** No author has a financial or proprietary interest in any material or method mentioned.

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Presbyopic small-incision cataract surgery with intraocular lens (IOL) implantation leads to less induced astigmatism and fewer higher-order aberrations, and such techniques are becoming increasingly popular.<sup>1-3</sup> Although few multifocal IOLs that can be implanted through incisions of 2.0 mm or smaller

In this study, we compared and evaluated the clinical results of 2 multifocal IOL models implanted through 1.7 mm clear corneal incisions using a biaxial microincision cataract surgery (MICS) technique. The 2 IOLs are similar except for slight differences in their diffractive design.

Can İ, Bostancı Ceran B, Soyugelen G, Takmaz T. Comparison of clinical outcomes with 2 small incision diffractive multifocal intraocular lenses. *J Cataract Refract Surg*. 2012 Jan; 38: 60-67.

# Our Study / Groups

B-MICS Surgery +  
Multifocal IOL  
implantation  
(n: 60)

Acri.Lisa 366 D  
(Zeiss, Berlin, Ger)  
(n: 30)

Group 1:



Acriva Reviol MFM  
611  
(VSY Biotech ,İst,  
Tur) (n:30)

Group 2:



Can İ, Bostancı Ceran B. Soyugelen G, Takmaz T. Comparison of clinical outcomes with 2 small incision diffractive multifocal intraocular lenses. *J Cataract Refract Surg.* 2012 Jan; 38: 60-67.

# IOLs



	<b>Acri.Lisa 366 D (Zeiss Berlin, Ger)</b>	<b>Acriva Reviol MFM 611 (VSY Biotech. İst, Tur)</b>
<b>Material</b>	Hydrophilic acrylic (25%) with hydrophobic surface	Hydrophilic acrylic (25%) with hydrophobic surface
<b>Optic Design</b>	Multifocal, Aspheric (-0.160 $\mu\text{m}$ SA)	Multifocal, Aspheric (-0.165 $\mu\text{m}$ SA)
<b>Haptic / Angulation</b>	Plate, 0°	Plate, 0°
<b>Diameter Optic/ Total (mm)</b>	6.0 / 11.0	6.0 / 11.0
<b>Lens Design</b>	Single-Piece, Diffractive +3.75 D add at the IOL plane, MICS	Single-Piece, Diffractive +3.75 D add at the IOL plane, MICS
<b>Light Distrubution Far / Near</b>	65 / 35 %	60 / 40 %
<b>Dioppter Range</b>	0 - + 32.0 D.	0 - + 45.0 D.
<b>A-constant ( Acoustic)</b>	117.8	118.0
<b>Diffractive Rings (n:)</b>	29	28 (active diffractive rings)
<b>PCO Prevention</b>	Optic + Haptic Square Edge	360 °Enhanced Sharp Edge

# Groups / Preoperative Features / Comparability

	All	Group 1 Acri.lisa	Group 2 Reviol	P †
Patients / Eye (n:)	32/60	16/30	16/30	1.000**
Sex* F/M	17/ 15	9 / 7	8 / 8	0,723**
Laterality R/L	29/31	15/15	14/16	0,796**
Age (year)*	52.04 ±6.73	51.10 ±5.63	53.81 ±8.35	0.197***
Follow-up (month)*	6.36 ±0.88	6.40 ±0.85	6.33 ±0.92	0.077***
UDVA ±SD*				
Decimal	0.41 ±0,21	0.46 ±0.25	0.36 ±0.16	0.080***
logMAR	0.43 ±0.26	0,39 ±0,27	0.47 ±0.22	0.271***
CDVA ±SD*				
Decimal	0,64 ±0,29	0.63 ±0,29	0.65 ±0,30	0.759***
logMAR	0.25 ±0,27	0.25 ±0.25	0.26 ±0,29	0.963***
Mean CCT (µm) ±SD	550.11±30.87	556.70 ±28.8	543.31 ±31.9	0.096***
Nuclear hardness*	NO 2-4	NO 2-4	NO 2-4	-

† Comparison of Group 1 and 2, F/M: Female / Male, R/L: Right / Left, UDVA: Uncorrected Distance Visual Acuity, CDVA; Best Corrected Visula Acuity, CCT: Central Corneal thickness, \*mean, ± standart deviation, \*\* chi-square test, \*\*\* student-t test

# Groups / Peroperative Features / Comparability

	All	Group 1 Acri.lisa	Group 2 Reviol	P †
Phaco Time (min)	0.150±0.18	<b>0.145 ±0.19</b>	<b>0.156± 0.16</b>	0.829*
Phaco Power (%)	4.65±4.34	<b>4.53 ±4.49</b>	<b>4.76 ±4.27</b>	0.851*
Effective Phaco Time (s)	0.618±0.91	<b>0.578 ±0.93</b>	<b>0.658±0.90</b>	0.739*
Total Operation Time (min)	17.34±1.59	<b>17.35 ±1.89</b>	<b>17.32 ±1.26</b>	0.936*
Final incision width (mm)	1.968±0.22	<b>1.975 ±0.26</b>	<b>1.963 ±0.17</b>	0.862*
Complications, n (%)				
PCR	2 (3.3)	<b>1 (3.3)</b>	<b>1 (3.3)</b>	1.000**
Iris prolapsus	4 (6.6)	<b>2 (6.6)</b>	<b>2 (6.6)</b>	1.000**

† Comparison of Group 1 and 2, ±Standart deviation, PCR: Posterior capsule rupture \*Student-t, \*\*Chi-square

# Surgical Technique

Surgical Technique	<b>Biaxial-MICS (1,2-1,4 / 1,7 mm)</b>
Surgeon	<b>i.C.</b>
Phaco machine	<b>Infiniti (Alcon)</b>
Nucleofractis technique	<b>Half-moon Supracapsular</b>
Phaco needle	<b>0,9 mm, 30°, Straight</b>
Sleeve	<b>No</b>
Chopper	<b>20 G. Fine-Nagahara irrigating (MST)</b>
I/A instrument	<b>Duet set 20 G. (MST)</b>

<b>Phaco Stage and Parameters</b>	
<u>Chop</u>	
Power (%)	40 L
Burst on (ms) / off (ms)	30/5
Vacuum (mmHg)	300 F
Aspiration rate (cc/ min)	25 F
Bottle height (cm)	110
<u>Epinucleus removal</u>	
Power (%)	15L
Vacuum (mmHg)	150 L
Aspiration rate (cc/ min.)	25 L
Bottle height (cm)	110
<u>Cortex and OVD removal</u>	
Vacuum (mmHg)	600 L
Aspiration rate (cc/ min.)	60 L
Bottle height (cm)	110

# Surgical Technique

**Acri.Lisa 366 D**

Acri-Shooter A2-2000

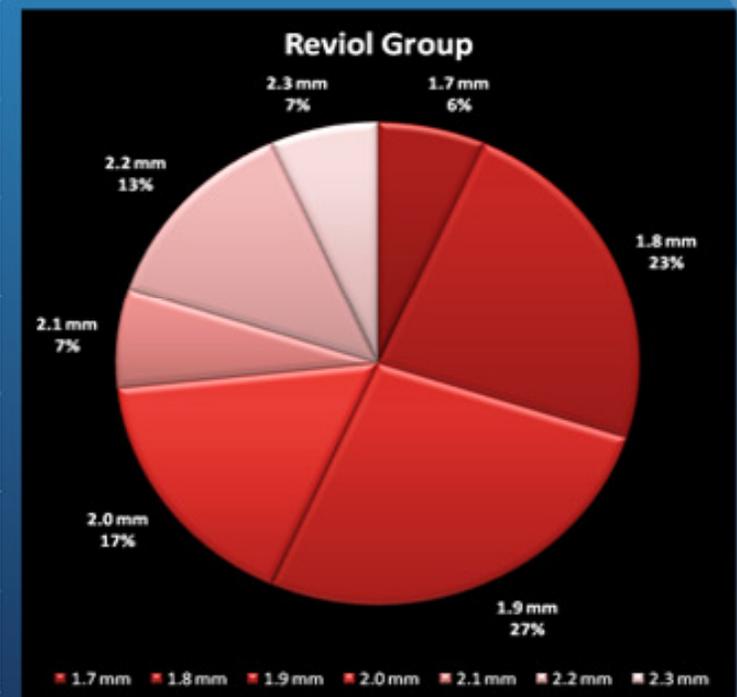
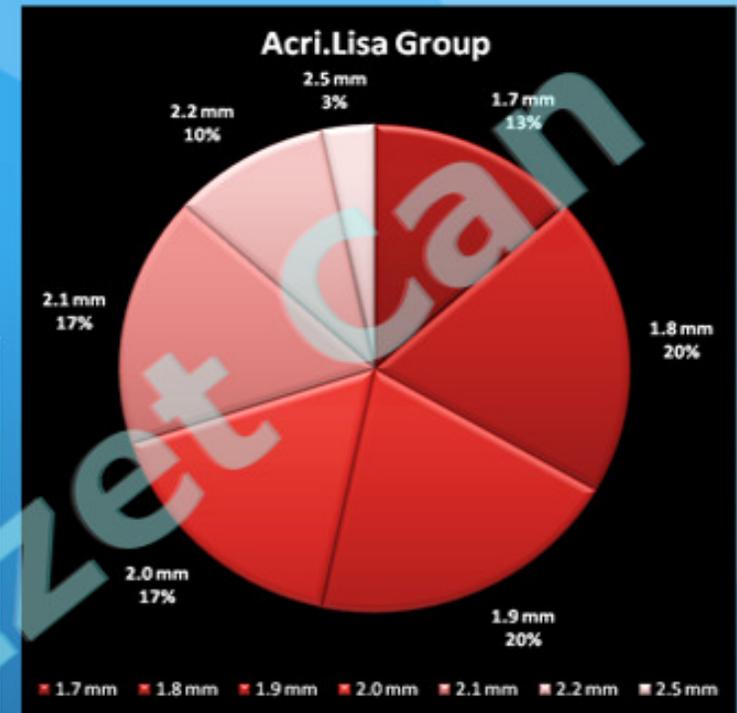
**Acrida Reviol MFM 611**

Viscojet LP604350

Prof. Dr. Izzet Can

# Final Incision Widths

Incision Widths	Acri.Lisa Group (n:)	Reviol Group (n:)
1.7 mm	4	2
1.8 mm	6	7
1.9 mm	6	8
2.0 mm	5	5
2.1 mm	5	2
2.2 mm	3	4
2.3 mm	-	2
2.5 mm	1	-
<b>Avarage (mm)</b>	<b>1.975 ±0.26*</b>	<b>1.963 ±0.17*</b>



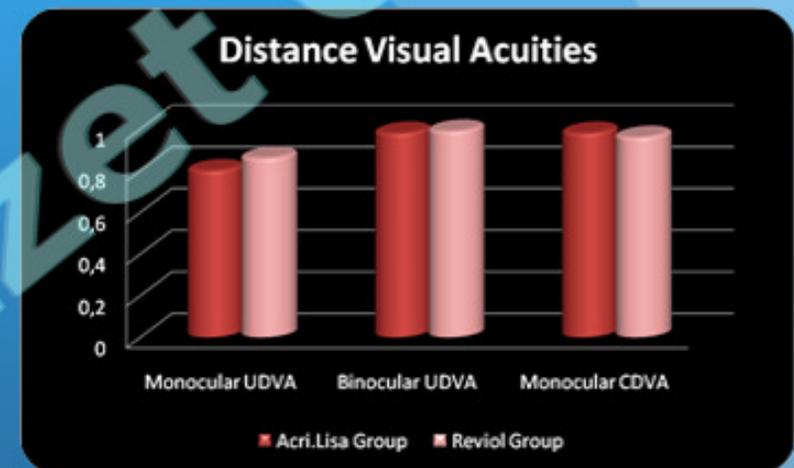
# Results / 1. Month

	Group 1 Acri.lisa	Group 2 Reviol	<i>p</i>
Refraction (SE) ,	-0.30 D. $\pm$ 0.30	-0.26 D. $\pm$ 0.28	0.584*
Mean CCT ( $\mu$ m)	554.36 $\pm$ 20.2	544.86 $\pm$ 21.31	0.082*

SE= Spherical equivalent, \* CCT=central corneal thickness; Student-t test

# Results / 6. Month

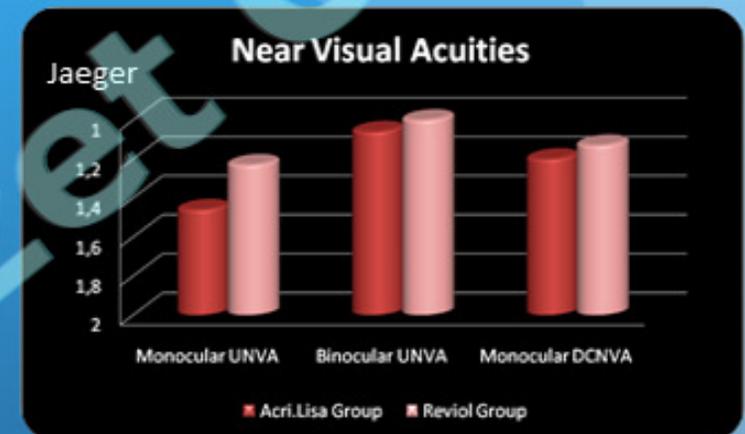
Distance Visual Acuity	Group 1 Acri.lisa	Group 2 Reviol	<i>P</i>
Monocular Mean UDVA ±SD Decimal logMAR	0.80±0.14 0.10±0.07	0.86±0.17 0.07±0.08	0.158* 0.113*
Binocular Mean UDVA ±SD Decimal logMAR	0.98±0.06 0,01±0.03	0.99±0.05 0,007±0.01	0.647* 0.647*
Monocular Mean CDVA ±SD Decimal logMAR	0.98±0.05 0.01±0.02	0.96±0.09 0.02±0.05	0.219* 0.219*



UDVA=uncorrected distance visual acuity, CDVA=corrected distance visual acuity; SD= Standard deviation, \*Student-t test

# Results / 6. Month

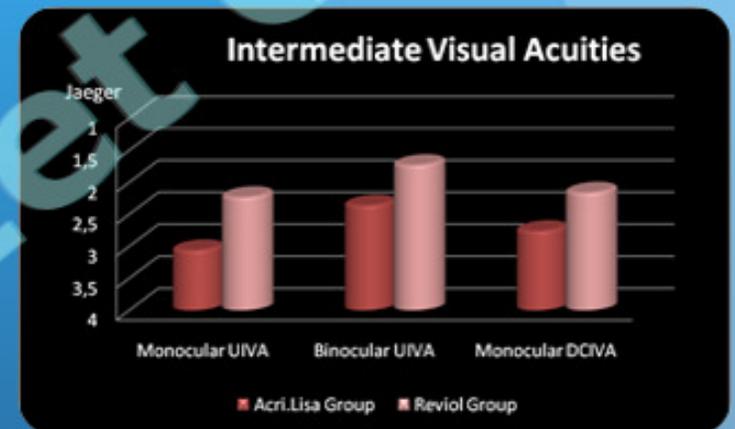
Near Visual Acuity	Group 1 Acri.lisa	Group 2 Reviol	<i>P</i>
Monocular Mean UNVA±SD Jaeger logMAR	J 1.46±0.73 0.08±0.20	J 1.23±0.50 0.02±0.05	0.155* 0.104*
Binocular Mean UNVA±SD Jaeger logMAR	J 1.06±0.25 0.007±0.03	J 1.00±0.00 0.00±0.00	0.155* 0.155*
Monocular Mean DCNVA±SD Jaeger logMAR	J 1.20±0.55 0.06±0.20	J 1.13±0.34 0.01±0.03	0.577* 0.219*



UNVA= uncorrected near visual acuity, SDCNVA= distance corrected near visual acuity, J= Jaeger, SD= Standard deviation, \*Student-t test

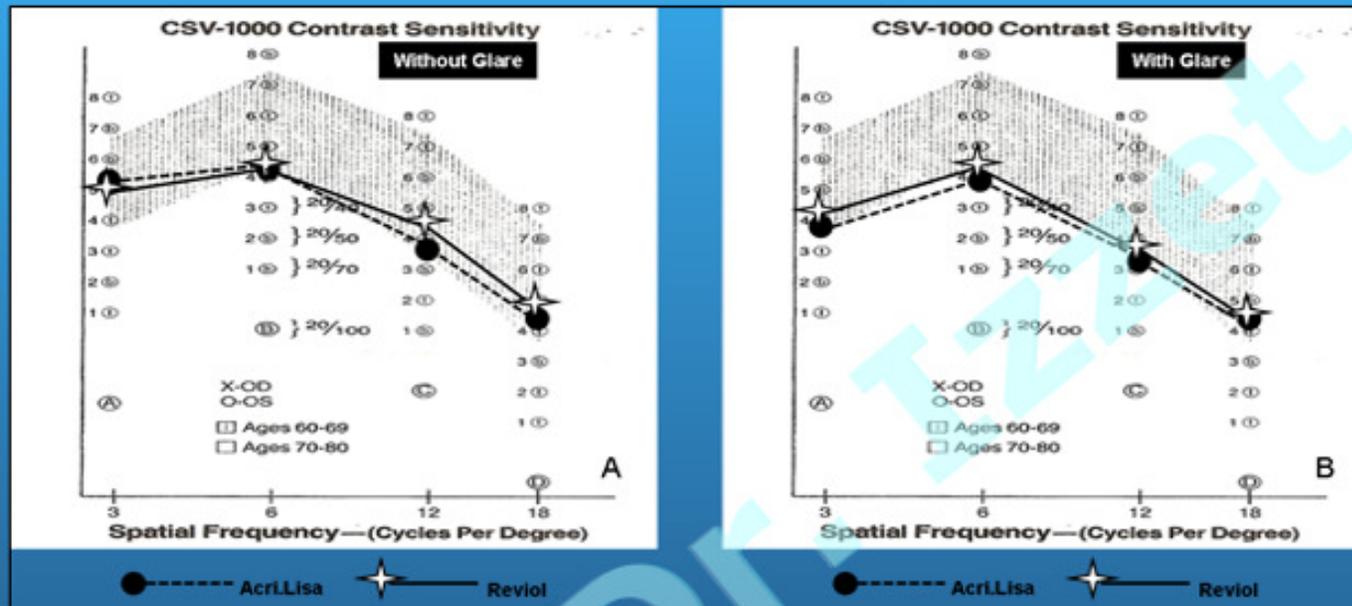
# Results / 6. Month

Intermediate Visual Acuity	Group 1 Acri.lisa	Group 2 Reviol	<i>P</i>
Monocular Mean UIVA ±SD Jaeger logMAR	J 3.06±0.90 0.16±0.055	J 2.23±0.72 0.11±0.064	0.000* 0.002*
Binocular Mean UIVA ±SD Jaeger logMAR	J 2.36±1.32 0.11±0.10	J 1.73±0.78 0.07±0.07	0.028* 0.041*
Monocular Mean DCIVA ±SD Jaeger logMAR	J 2.76±0.81 0.14±0.051	J 2.16±0.74 0.11±0.066	0.004* 0.013*



UIVA= uncorrected intermediate visual acuity, DCIVA=distance corrected intermediate visual acuity, J= Jaeger, SD= Standard deviation, , \*Student-t test

# Results / 6. Month



Contrast Sensitivity (log units)	Group 1 Acri.lisa	Group 2 Reviol	P
<b>Without glare</b>			
3 cpd	1.66±0.22	1.63±0.21	0.644*
6 cpd	1.72±0.16	1.80±0.24	0.206*
12 cpd	1.39±0.27	1.49±0.37	0.274*
18 cpd	1.03±0.27	1.08±0.42	0.565*
<b>With glare</b>			
3 cpd	1.45±0.22	1.55±0.20	0.164*
6 cpd	1.66±0.17	1.74±0.99	0.130*
12 cpd	1.28±0.27	1.37±0.25	0.304*
18 cpd	0.98±0.29	1.06±0.29	0.362*

\*Student-t test

# Results / Complications and Complaints

	Group 1 Acri.Lisa	Group 2 Reviol	<i>P</i>
Inflammatory anterior chamber reaction	-	-	
Halo	7 eyes (23.3%)	8 eyes (26.6%)	0.766*
Glare	6 eyes (21.4%)	6 eyes (20.0%)	1.000*
Spectacle independence for far and near	100 %	100 %	1.000
Intermediate distance visual problems	4 patients (25.0%)	-	
Spectacle for intermediate distance	1 patient (6.2%)	-	
PCO - Nd YAG Capsulotomy	1 eye (3.3%)	1 eye (3.3%)	



\*Chi-square test, PCO= Posterior capsule opasification

# Conclusion

- Both Acri-Lisa 366 D and Acriva Reviol MFM 611 seemed to be effective multifocal IOLs to take the advantages of microincisional cataract surgery techniques.
- Acriva Reviol IOL gave much better and satisfactory results for intermediate distance.
- Thank you very much for your attention.